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ABSTRACT

Drug use and delinquency share many common antecedents: early antisocial behavior, difficulties in school, impaired family relationships, delinquent or drug-using peers, and rebelliousness. But these common factors could underlie a cluster of problem behaviors or lead to distinctly different behavioral manifestations. Using data from 1,363 West Coast students in grade 10, this study examines the relationship between drug use and deviant behavior. Analyses of student responses to self-administered surveys revealed three correlated higher-order dimensions of behavior: (1) alcohol use and sociability; (2) deviant behavior, including drug use other than alcohol; and (3) rebelliousness. A close relationship among tobacco and cannabis use and deviant behavior was revealed. Results suggest that drug prevention programs that curb initial and regular use of the gateway drugs, such as alcohol, tobacco, and cannabis, may have a broader, spillover impact on other deviant behavior. Results also suggest that programs aimed at both deviance and drug use are worth pursuing and that schools are an important venue for identifying deviant youth. The strong links between alcohol use and sociability underline the need to counteract the social acceptability of drinking and focus on the social contexts in which it occurs. Contains 38 references. (RJM)

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Associations Between Drug Use and Deviant Behavior in Teenagers

Ron D. Hays and Phyllis L. Ellickson

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Associations Between Drug Use and Deviant Behavior in Teenagers

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ASSOCIATIONS BETWEEN DRUG USE AND DEVIANT BEHAVIOR IN TEENAGERS

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Abstract — Confirmatory factor analyses of self-reports of drug use and deviant activity from 701 female and 662 male students in grade 10 revealed three correlated higher-order dimensions of behavior: alcohol use and sociability, rebelliousness, and deviant behavior, including drug use other than alcohol. The intercorrelations between these dimensions were 0.548 or higher for both male and female students, indicating an underlying unidimensionality of these activities. These results suggest that drug prevention programs that curb initial and regular use of the gateway drugs may have a broader, spillover impact on other deviant behavior. They also suggest that programs aimed at both deviance and drug use are worth pursuing and that schools are an important venue for identifying deviant youth. The strong links between alcohol use and sociability underline the need to counteract the social acceptability of drinking and focus on the social contexts in which it occurs.

Drug use and delinquency share many common antecedents — early antisocial behavior, difficulties in school, impaired family relationships, delinquent or drug-using peers, and rebelliousness (Chassin, 1984; Hawkins, Jenson, Catalano, & Lishner, 1988; White, Pandina, & LaGrange, 1987). But those common factors could underly a cluster of problem behaviors *or* lead to distinctly different behavioral manifestations. Some observers argue that the two are inextricably linked — that early and later stages of drug use "go along with" early and later stages of delinquency (Elliott, Huizinga, & Menard, 1989; Jessor & Jessor, 1977); others argue that users and delinquents form distinct groups that may not share a more general subculture of deviance (White, Johnson, & Garrison, 1985; White et al., 1987).

Clarification of this issue is important because it can provide clues about how to prevent or reduce both drug use and delinquency. If, for example, we can identify commonalities between adolescent substance use and other delinquent behavior, we may be able to zero in on prevention "pressure points" — specific behaviors that, if they occur by a particular age, raise alarm signals about the child's future likelihood of getting into trouble.

Numerous empirical studies have demonstrated a positive association between harder drug use and deviance (Elliott et al., 1989; Kandel, Simcha-Fagan, & Davies, 1986; Newcomb, Maddahian, & Bentler, 1986; White et al., 1987). But an association between alcohol, an important gateway drug, and deviance has not been demonstrated, while relations between alcohol use and specific school-related problems (often considered to be a precursor or subset of delinquent behavior) have not been fully explored. For example, one study documented an effect of drinking on subsequent nonprofit crimes of violence (rape and aggravated assault) among young

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adolescents (Elliott et al., 1989), whereas another, covering grades 7 or 8 to grades 11 or 12, revealed no direct effects of alcohol use on general deviance (Huba & Bentler, 1984). In an analysis of data from young adults aged 18 to 22 in the Monitoring the Future study, cross-lagged effects between binge drinking and deviance and criminal behavior were not observed (Osgood, Johnston, O'Malley, & Bachman, 1988). In addition, Windle's (1990) analysis of the National Longitudinal Youth Survey revealed nonsignificant effects of general delinquency on alcohol use over time after controlling for ethnicity, gender, and substance use.

Using data from 1,363 West Coast adolescents, this paper seeks to further an understanding of the relationship between drug use and deviant behavior. It specifically examines the association between drug use and deviant activity during grade 10.

METHOD

Subjects

The student data were collected to evaluate the effectiveness of Project ALERT, a drug prevention trial conducted in 30 California and Oregon schools (Ellickson & Bell, 1990; Ellickson, Bell, & McGuigan, 1993). Drawn from eight urban, suburban, and rural communities, nine of the 30 schools had a minority population of 50% or more. For the analyses presented here, we selected students from the 10 control schools. We omitted treatment students from the analysis because of the possible effects of the experiment on the relations among the constructs studied.

Survey data completed by respondents during grade 10 are used for the analyses. Hence, we examine a time period during which vulnerability to peer influences increases and peer conformity to antisocial behaviors appears to peak (Berndt, 1979; Kandel, 1985). The resulting sample (N = 1,363) was 51% female, 70% White, 10% Hispanic, 9% Black, 8% Asian, and 2% American Indian. The average age of the respondents at grade 10 was 15.76 (SD = 0.55).

Students in the study's 30 participating schools completed self-administered surveys about their drug use and related behavior at each wave of data collection. Several steps were instituted to minimize response bias. To provide a stimulus for truth-telling, we collected a saliva sample from each student immediately before administration of the survey, informing the students that tobacco and marijuana can be detected in saliva and that the samples would be tested.

Confidentiality measures included preventing teachers, parents, or other nonresearch personnel from seeing student responses, using trained personnel to administer surveys, identifying student surveys by number rather than name, and hand-carrying sensitive data (separate sheets connecting names to I.D. numbers) from the school to RAND. We also obtained a Certificate of Confidentiality from the U.S. Department of Health and Human Services that precludes public or private individuals from obtaining individual data by subpoena. Parental consent for participation was obtained using a passive-consent procedure (Ellickson & Hawes, 1989). Written student consent was obtained immediately before administering the survey.

Analyses based on data from students in all 30 schools suggest that the great majority of the students told the truth about drug use. At baseline and 15 months later, 95% of students with cotinine scores that identified them as recent tobacco users (N = 603) admitted on the questionnaire to use of cigarettes or chewing tobacco in the past month (Freier, Bell, & Ellickson, 1991). Across four waves of data, the proportion of students who denied using a gateway substance after previously

admitting use averaged about 5%. Retractions of frequent use averaged substantially less than 1% (Reinisch, Bell, & Ellickson, 1991).

Analytic techniques

An initial exploratory factor analysis was used to help determine the number of dimensions underlying the indicators of deviance, drug use, and other behaviors (rebelliousness, sociability, involvement in sports) at grade 10. Several criteria were examined, including the scree test (Cattell, 1966), Guttman's (1940) weakest lower bound, and parallel analysis (Montanelli & Humphreys, 1976).

The exploratory factor analysis was used to help guide the specification of a structural model to be tested using confirmatory factor analysis. Estimates from the exploratory analysis were not imposed on the confirmatory solution (e.g., factor loadings were freely estimated).

In confirmatory factor analysis, model plausibility is assessed by comparing the data structure implied by the model with the observed data. The procedure involves examining the pattern of sample covariances among measures with those generated by the hypothesized model. Because the relations between different constructs involve latent (as opposed to measured) variables, bias stemming from random measurement error is eliminated (Judd, Jessor, & Donovan, 1986).

We evaluated the goodness-of-fit of the confirmatory factor analysis model using the chi-square statistic and three measures of practical fit: rho, delta, and the comparative fit index, CFI (Bentler, 1990). Because the likelihood of rejecting a model based on the chi-square test increases with sample size, the practical measures provide more appropriate goodness-of-fit tests for our sample. Models with delta, rho, or CFI values less than 0.90 should not be accepted (Bentler, 1990; Bentler & Bonett, 1980).

The analysis was conducted using the EQS (Bentler, 1993) computer program. Maximum likelihood estimation was used because of the size of the models evaluated and its general robustness to nonnormality (Huba & Harlow, 1987). As is typical with confirmatory factor analysis models, correlated uniqueness terms (correlations among unique variance components of measured variables) were estimated as necessary to improve the model's fit to the data.[1] Thus, the resulting models should be regarded as provisional and require replication in other samples (Cudeck & Browne, 1983; MacCallum, 1986). Confirmatory factor analytic models were estimated for females (n = 701) and males (n = 662) separately.

Measures

The study's survey instruments were designed after a comprehensive review of previous empirical and theoretical work. Almost all of the selected questions had been successfully used in national surveys of adolescent drug use, although some were modified to accommodate the reading levels and experience of seventh and eighth graders. Five successive versions of the baseline survey were pretested before use in participating schools. These pretests allowed us to compare alternative versions

[1]Confirmatory factor analysis, despite the terminology, often is implemented as a combination of confirmation and exploration of the data. Modifications to the original model (i.e., data exploration) can be substantially influenced by chance (MacCallum, Roznowski, & Necowitz, 1992). This aspect of model modification, labeled "specification search" by MacCallum (1986), can nevertheless yield important insights into the limitations of the original model and plausible variations.

Table 1. Summary of 35 analytic variables

Alcohol use
Quantity–frequency of use in last month
Frequency (*none* to *more than 8 days*) of binge drinking (3+ drinks a day) in last month
Frequency of last year alcohol use before or during school hours[a]
Social activities (Frequency — *almost never or never* to *most days*) of:
Dating
Going to parties or dances
Riding in car or motorcycle for fun
Cannabis and cigarette use
Quantity–frequency of marijuana use in last month
Frequency of last year marijuana use before/during school hours
Quantity–frequency of cigarette use in last month
Hashish use
Hard-drug use (Last year frequency — *none* to *10 or more times*) of:
PCP
LSD
Other psychedelics
Downers
Uppers
Cocaine
Inhalants or glue
Deviant behavior (Last year frequency — *not at all* to *more than three times*) of:
Theft of something worth more than $20
Took something from a store
Broke into a house, school, or place of business
Trouble with the police
Ran away from home
Sent out of classroom
Damaged something that did not belong to me[b]
School problem behaviors
Absences in last 2 months
Skipped school (*not at all* to *more than three times*)
Grades (mostly A's to mostly F's)
Rebelliousness/conformity (*strongly agree* to *strongly disagree*)
Feel guilty when I break a rule
When told to do something by teacher I do it
Might use a false I.D.
Enjoy doing things I should not do
Leave restaurant without paying bill
2+ hours homework a day
Athletic involvement (Frequency — *almost never or never* to *most days*) of:
Jogging or exercise
Participating in team sports

[a]Loads on deviant behavior factor.
[b]Loads on rebelliousness/conformity factor.

for the frequency of problem indicators — such as missing data, internal inconsistencies, and student questions indicating confusion — and to select the most successful items for the final instrument.

To examine the interrelationships between drug use and deviant behavior at grade 10, we evaluated 35 behavioral indicators (see Table 1). For the gateway drugs (alcohol, cigarettes, and marijuana), we measured quantity–frequency of use in the past month and, in the case of alcohol and marijuana, use before or during school. We also asked about the frequency of binge drinking (three or more drinks on the same occasion) in the past month and past year use of six hard drugs (uppers, downers, cocaine, PCP, LSD, other psychedelics) plus inhalants. Items tapping how adolescents spend their time focused on social activities (dating, parties, riding

around), exercise, and sports. The nondrug deviant behavior items covered lawbreaking activities (breaking into a building, theft), vandalism, status offenses, and troublemaking in school. Four school-specific measures were included: grades, doing homework, absences, and skipping school. Rebelliousness or lack of conformity assessed willingness to violate accepted norms (not pay a restaurant bill, use a false I.D.) and attitudes about rule-breaking.

RESULTS

Average scores on the 35 analysis variables by gender are provided in Table 2. Males were significantly ($p < .05$) more likely than females to report using PCP, glue or inhalants, and hashish. Male students also were more likely to be rebellious, to engage in deviant activity, and to report riding around for fun. Females reported a greater number of absences, more frequent truancy, and higher levels of smoking than did males. Female students also reported more frequent dating and athletic involvement (jogging or exercise, team sports) than did males.

The number-of-factor criteria bounded the number between 6 and 9 (Guttman's weakest lower bound indicated 8 factors; the scree test suggested 6 factors, and parallel analysis and discontinuity analysis indicated 6, 8, or 9 factors). Examination of obliquely rotated factor solutions (Hendrickson & White, 1964) with 6 to 12 factors supported an eight-factor simple structure (rotating more factors did not lead to additional substantively meaningful factors).

We specified a higher-order confirmatory factor model with three higher-order domains (alcohol and sociability, deviance, rebelliousness) and eight lower-order factors: alcohol use, social activities, cannabis and cigarette use, hard-drug use, deviant behavior, school problems, rebelliousness, and athletic involvement. After deleting nonsignificant estimates (loading of cannabis and cigarette use on the alcohol and sociability higher-order factor for females, correlations of athletic involvement with four of the lower-order factors) and adding correlated uniqueness estimates (24 for females, 21 for males), the model was found to fit the data well for females (chi-square (591, $N = 701$) = 1404.95, $p < .01$; rho = 0.90, CFI = 0.91) and males (chi-square (593, $N = 662$) = 1607.54, $p < .01$; rho = 0.90, CFI = 0.91). Standardized factor loadings for the eight lower-order factors in this model are provided in Table 3. The higher-order factor loadings and intercorrelations are shown in Figure 1.

Factor loadings were all statistically significant and moderate to large in size (see Table 3). Hashish loaded on both the hard-drug use factor and the cannabis use factor. Loadings tended to be similar for males and females, but PCP, LSD, other psychedelics, inhalants, and hashish had notably larger loadings on the hard-drug use factor for males. Similarly, three of the deviant behavior indicators (theft of more than $20, theft from a store, breaking into a house or school) loaded higher on the deviance dimension for male than for female students.

The higher-order factor loadings were substantial for both females and males. The alcohol and sociability factor includes measures that tap frequent alcohol use, binge drinking, and an active peer social life (dates, parties, and riding around for fun). The higher-order deviance factor includes lawbreaking (breaking into a building, theft from a store, theft worth more than $20), running away from home, trouble with the police, and troublemaking in school (being sent out of the classroom). It also includes use of two gateway drugs, marijuana and cigarettes (defined by how

Table 2. Average scores on 35 analysis variables by gender

	Females	Males	Range
Alcohol use			
Quantity–frequency of use	0.22	0.25	0–2.5
Frequency of binge drinking	0.79	0.76	0–4
Alcohol use before/during school	0.42	0.48	0–4
Social activities			
Dating	2.01	1.91*	1–4
Parties or dances	2.00	1.94	1–4
Ride around for fun	2.29	2.46*	1–4
Cannabis and cigarette use			
Quantity–frequency of marijuana use	0.07	0.11	0–2.5
Marijuana use before/during school	0.33	0.39	0–4
Quantity–frequency of cigarette use	1.15	0.82*	0–16.7
Hashish use	0.14	0.25*	0–1
Hard-drug use			
PCP	0.03	0.08*	0–1
LSD	0.13	0.18	0–1
Other psychedelics	0.11	0.15	0–1
Downers	0.10	0.13	0–1
Uppers	0.27	0.23	0–1
Cocaine	0.23	0.19	0–1
Inhalants or glue	0.12	0.18*	0–1
Deviant behavior			
Theft > $20	0.15	0.30*	0–3
Theft from store	0.38	0.56*	0–3
Broke into house, school	0.04	0.16*	0–3
Trouble with police	0.19	0.35*	0–3
Ran away from home	0.23	0.15*	0–3
Sent out of classroom	0.36	0.74*	0–3
Damaged something on purpose	0.24	0.61*	0–3
School behaviors			
Absences	2.08	1.88*	1–4
Skipped school	1.31	1.10*	0–3
School grades	2.26	2.38*	1–5
Rebelliousness/Conformity			
Feel guilty	1.91	2.19*	1–4
Do what teacher says	1.65	1.87*	1–4
Might use false I.D.	1.79	1.94*	1–4
Enjoy doing things I should not do	2.78	2.76	1–4
Leave restaurant without paying	1.44	1.81*	1–4
2+ hours homework/day	2.25	2.46*	1–4
Athletic involvement			
Jogging or exercise	2.62	2.36*	1–4
Team sports	2.91	2.40*	1–4

Note: Females: $n = 701$; males: $n = 662$; range shown is observed and possible range for all measures except the three quantity–frequency measures, for which it is the observed range of raw scores. The significance of difference between females and males on the quantity–frequency measures is based on the natural logarithm transformation of these measures.

*$p < .05$, two-tailed.

often the substance has been used in the past month and the average quantity of use over that period), the frequency of using alcohol or marijuana before or during school hours, and the frequency of hard-drug use.

The rebelliousness dimension includes vandalism, school-related problems, and a predisposition toward nonconformity. Skipping school or class clearly covaries with higher absenteeism, less time spent on homework, and poorer grades. Rebelliousness also includes a lack of concern about engaging in rule-breaking (not feeling guilty

Table 3. Standardized parameter estimates (factor loadings) for final higher-order model

	Females	Males
Alcohol use		
Frequency of binge drinking	0.930	0.938
Quantity–frequency of use	0.950	0.937
Social activities		
Dates	0.654	0.673
Parties or dances	0.685	0.815
Ride around for fun	0.658	0.517
Cannabis and cigarette use		
Quantity–frequency of marijuana	0.674	0.869
Marijuana use before/during school	0.810	0.867
Quantity–frequency of cigarette use	0.720	0.593
Hashish	0.412	0.440
Hard-drug use		
PCP	0.437	0.751
LSD	0.646	0.880
Other psychedelics	0.683	0.814
Downers	0.604	0.658
Uppers	0.736	0.744
Cocaine	0.714	0.764
Inhalants or glue	0.334	0.537
Hashish	0.203	0.463
Deviant behavior		
Theft > $20	0.412	0.637
Theft from store	0.493	0.600
Broke into house, school	0.439	0.574
Trouble with police	0.664	0.642
Ran away from home	0.631	0.562
Alcohol use before/during school	0.671	0.645
Sent out of classroom	0.497	0.529
School problems		
Absences	0.585	0.652
Skipped school	0.775	0.777
School grades	0.501	0.529
Rebelliousness/Conformity		
Feel guilty	0.559	0.517
Do what teacher says	0.537	0.503
Might use false I.D.	0.533	0.541
Enjoy doing things I should not do	0.457	0.440
Leave restaurant without paying	0.328	0.443
Damaged something on purpose	0.438	0.600
2+ hours homework/day	0.435	0.416
Athletic involvement		
Jogging or exercise	0.648	0.708
Team sports	0.686	0.653

Note. Maximum likelihood parameter estimates are shown. Females: n = 701; males: n = 662.

when breaking a rule, "enjoying doing things I shouldn't do") and a willingness to violate behavioral norms (leave a restaurant without paying, use a false I.D., disobey the teacher).

The three higher-order factors were strongly intercorrelated, ranging from 0.610 to 0.753 for females and from 0.548 to 0.795 for males. Athletic involvement did not load on any of the three higher-order factors, but it correlated positively with social activity and negatively with cannabis use, school problems, and rebelliousness (see Fig. 1).

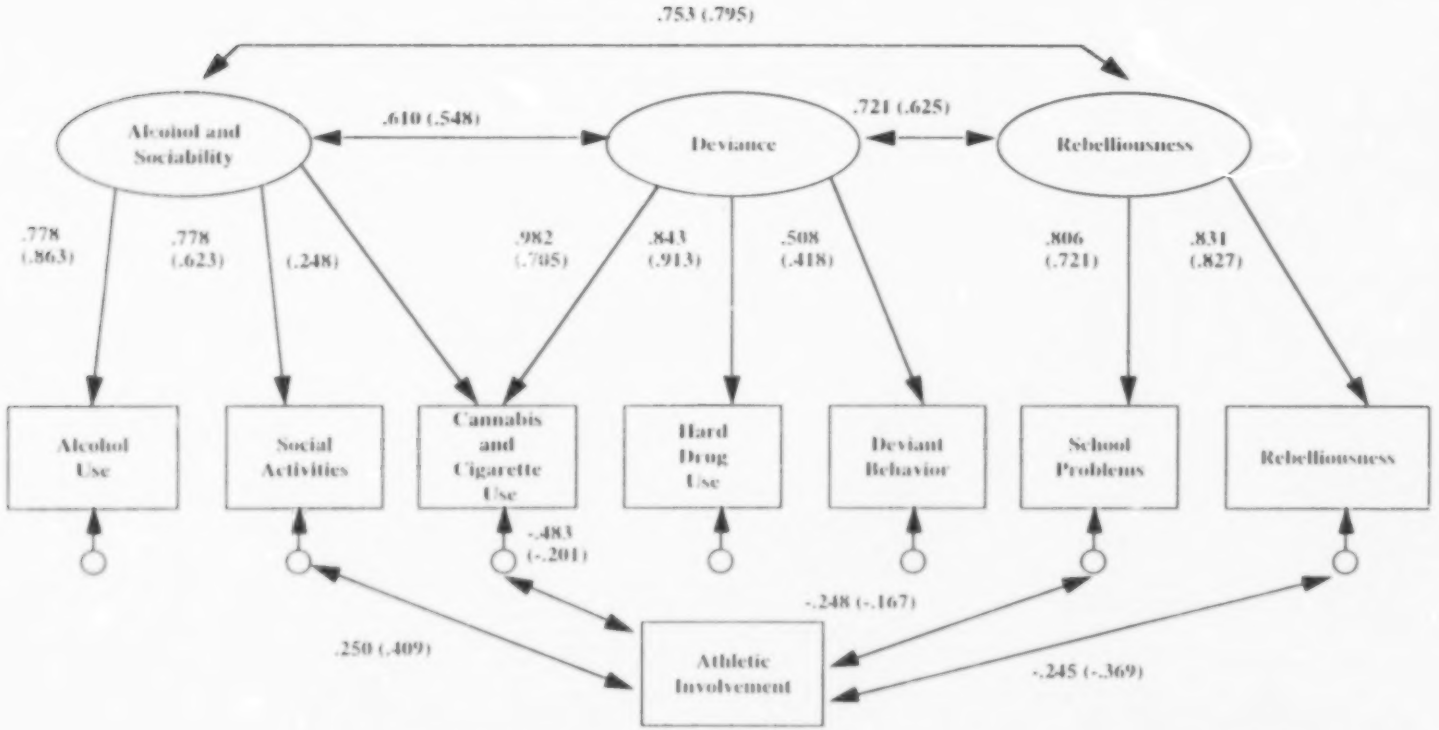

Fig. 1. Higher-order factor model (estimates for males in parentheses).

DISCUSSION

Confirmatory factor analysis of self-reports covering a variety of behaviors at grade 10 supported three higher-order dimensions: alcohol and sociability; deviance (including drug use); and rebelliousness. For the tenth graders studied here, we see evidence for a general dimension of deviance or unconventionality as well as specificity of deviance within this general dimension. Our results thus parallel those found in a longitudinal analysis of older teenagers between the ages of 18 and 22 (Osgood et al., 1988). The strong correlations among the different deviant behaviors observed in this study are also consistent with previous delinquency research (e.g., Elliott et al., 1989; Parker & McDowell, 1986).

These findings provide a clear picture of the close relationship between tobacco and cannabis use and deviant behavior. Greater involvement with cigarettes and marijuana, as well as use of hard drugs, goes along with more deviance. Underscoring this picture are results of longitudinal scalogram analysis that demonstrate that regular (weekly) marijuana use is at the same level of drug-use involvement as use of most hard drugs and that regular smoking constitutes a stage just after initial involvement with pills and before initial use of cocaine and other illicit drugs (Ellickson, Hays, & Bell, 1992).

This linkage suggests that drug prevention programs that curb both initial and regular use of these gateway drugs may have a broader, spillover impact on early deviant behavior. If drug prevention efforts keep adolescents from advancing along a sequence of problem behavior involvement, they may succeed in preventing deviant behaviors as well. There is a need for research that addresses this question.

At the same time, we note that the linkage among rebelliousness, deviant behavior, and greater involvement with both gateway substances and other drugs indicates that broader approaches aimed at both drug use *and* deviance may be worth pursuing. Early rebellion cleary presages later substance use, as indicated by the fact that 41% of the seventh graders who had skipped school or class in the past year had tried pills by grade 10 and 57% had become weekly drinkers. The strong associations between early truancy and later drug use, as well as among concurrent school-related problems, drug use, and deviance outside school suggest that the three may covary systematically together over time. Thus, developing programs that capitalize on common antecedents (while also addressing important differences) should be both feasible and worthwhile.

Our results also suggest that schools are an important venue for identifying deviant youth. The rebelliousness dimension highlighted a strong relationship among truancy, other school problems (such as poor grades, absenteeism, disobeying the teacher, and inattention to homework), and rebelliousness outside school, while the association between rebelliousness and the deviance factor highlights the link between problems in school and engaging in illegal activities (drug use, stealing, status offenses, etc.). Thus, adolescents exhibiting school-related difficulties are likely to be involved in trouble outside of school as well, and the signals that teachers receive about problems *in school* provide important information about children whose trajectory is likely to be troubled along several dimensions. Diverting that trajectory clearly requires timely intervention, and the information that teachers obtain, particularly elementary and middle school teachers, could facilitate that timeliness (Spivak, 1984).

The three specific underlying pockets of activity identified here correspond to general notions about varying levels of problem behavior. Drinking and sociability appear to represent the least serious level of activity; rebelliousness is viewed as an

intermediate level of severity; and deviant behavior, including use of drugs other than alcohol, reflects the most serious behavior.

Clearly, current alcohol use carries a distinctly different meaning among tenth graders than does use of other drugs: It discriminates more sharply between the less and the more sociable than between the less and more deviant. The fact that exercise and sports load almost as heavily on this factor as on the minor deviance (rebelliousness) factor further underlines this distinction: Whereas teenagers who exercise or participate in team sports are less likely to engage in minor deviant acts, they are more likely to drink.

However, although not necessarily statistically deviant among high school teenagers, frequent alcohol use carries serious public health implications. Accidents are the leading cause of death among young people and alcohol use is involved in most teenage accidents (Richardson, 1985; cited by Fell, 1990). Our data show that indicators of alcohol use load strongly on the factor that also includes indicators of the time spent going to parties or dances, going out on dates, and riding around in a car for fun. Hence, for tenth-grade students, alcohol use appears to be a concomitant of social activities with peers, a result that is consistent with other observations that the most sociable young people are the frequent drinkers (Tolone & Tieman, 1990).

The social context of drinking underlines a critical focus for prevention programs: alcohol use in association with peer activity. Drinking with peers is an important target of efforts to enhance resistance self-efficacy (Hays & Ellickson, 1990) and to minimize negative consequences of use (e.g., MADD's designated driving campaign). Recent work suggests, however, that school-based prevention programs aimed at helping younger adolescents resist pressures to drink have only short-lived effects on drinking behavior or work for only a small subset of youth (Ellickson & Bell, 1990; Shope, Dielman, Butchart, Campanelli, & Kloska, 1992). Stronger societal and community efforts to reinforce prevention messages are clearly needed to ensure long-term reductions in teenage drinking. These results support that conclusion, pointing to the importance of parental efforts to supervise adolescents' parties as well as to broaden societal efforts to combat media images that associate drinking with good times, popularity, and glamour.

Although this study has provided further documentation for noteworthy associations between a variety of problem behaviors among young adolescents, conclusions about causality from cross-sectional data are not possible. Prospective studies are needed to elucidate these relationships further. Cross-lagged panel models hold particular promise in shedding additional light on the directionality of influences among different behaviors (Hays, Marshall, Wang, & Sherbourne, 1994).

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